D 114599 **(Pages : 2)** **Name.....**

Reg. No.....

FIRST SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, NOVEMBER 2024

(CBCSS)

Physics

PHY IC 03—ELECTRODYNAMICS AND PLASMA PHYSICS

(2019 Admission onwards)

Time : Three Hours Maximum : 30 Weightage

Section A

8 *Short questions answerable within* 7.5 *minutes*
Answer **all** *questions, each question carries weightage* 1.

1. Write down Faraday's law with amperes correction.
2. Define polarization current.
3. What is the significance of plasma frequency ?
4. Define plane of incidence.
5. Define reflection co-efficient and transmission co-efficient.
6. Define plasma parameter.
7. Define Transverse electro magnetic wave.
8. What is micro-strip lines ?

(8 × 1 = 8 weightage)

Section B

4 *essay questions answerable within* 30 *minutes.*
Answer any **two** *questions, each question carries weightage* 5.

9. Analyze the behaviour of transverse magnetic waves allow uniform guiding structures.
10. Write down Maxwell's equations in medium. Explain the relevance of the equations.
11. Explain the general transformation rules in electromagnetic fields to obtain rules of transformations.

Turn over

12. Explain group velocity, face velocity and derive the relation connecting them. Also write down the conditions for no dispersion, normal dispersion and anomalous dispersion.

(2 × 5 = 10 weightage)

Section C

7 problems answerable within 15 minutes.
Answer any **four** *questions, each question carries weightage 3.*

13. Explain how a changing electric field induces a magnetic field

14. The permittivity of water at optical frequencies is $1.75\varepsilon 0$. It is found that an isotropic light source at adistance d under water yields an illuminated circular area of a radius 5 m. determine d.

15. The electric field intensity of a linearly polarized uniform plane wave propagating in the positive z direction is in seawater is $E a_x 100 \cos(10^7 \pi t)$ (V/m) at Z = 0 .the constitutive parameters of seawater are εr =72, μ_r = 1 and σ = 4 (S/m). Determine the attenuation constant, phase constant, intrinsic impedance, phase velocity, wavelength and skin depth (Problem).

16. Calculate Debye length of a collection of plasma at temperature 1000C contains a density $n = 4 \times 10^6\ m^{-3}$.

17 Compute the density (unit m-3) of an ideal gas under the following conditions a) 0°C and 760 Torr (1 Torr = 1 mm of HG) pressure b) In vacuum at 10^{-3} Torr pressure and Temp = 20°C.

18. Explain boundary conditions of electrodynamics.

19. What is field Tensor ? Explain.

(4 × 3 = 12 weightage)